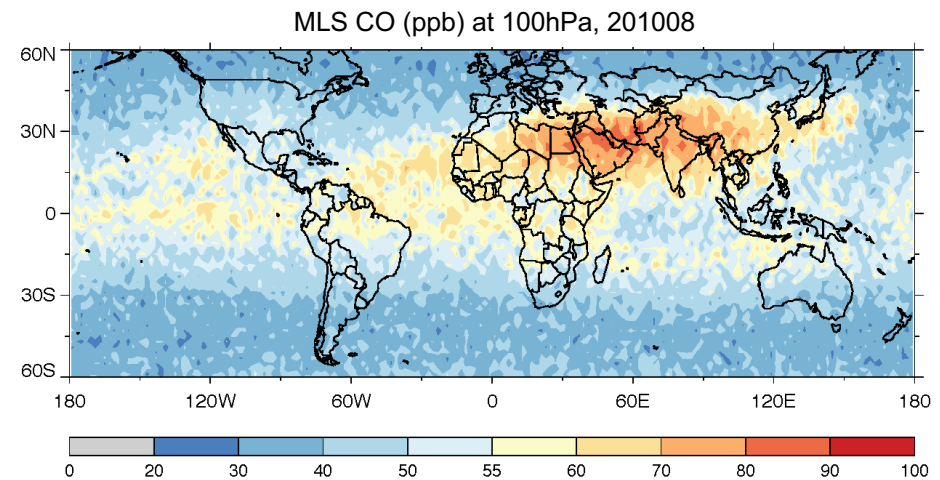
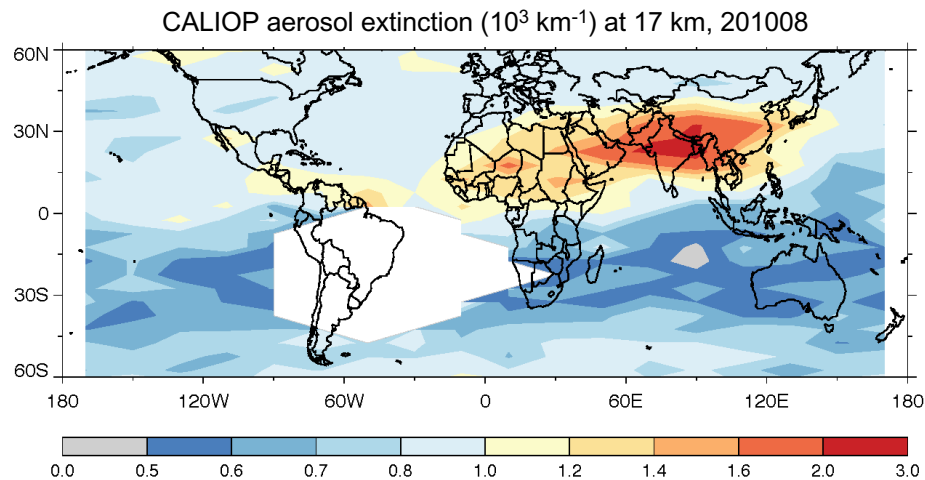


AeroCom-III UTLS model experiment: Current status and preliminary results

Mian Chin, Huisheng Bian, Toshi Takemura, Paul Ginoux,
Xiaohua Pan, Tom Kucsera



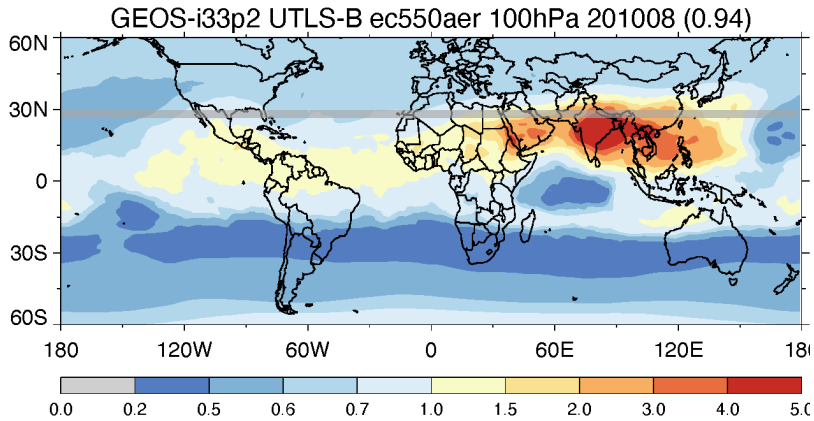
Objectives and participating models

- Objectives:
 - Compare and evaluate the model simulated aerosol and precursors in the UTLS regions
 - Examine the origins and transport pathways of aerosols in the UTLS region (e.g., convective transport, advection, chemical formation, and direct injection)
 - Assess the contributions of anthropogenic and volcanic emissions to the decadal variations of UTLS aerosols
 - Coordinate with other community projects
- Evaluation datasets:
 - Satellite observations from OSIRIS, SCHIAMACY, CALIOP, OMPS-LP for aerosol extinction profiles in UTLS
 - Satellite observations from MLS for CO profiles in UTLS
 - Aircraft measurements (StratoClim, HIPPO, ATom, CARIBBIC)

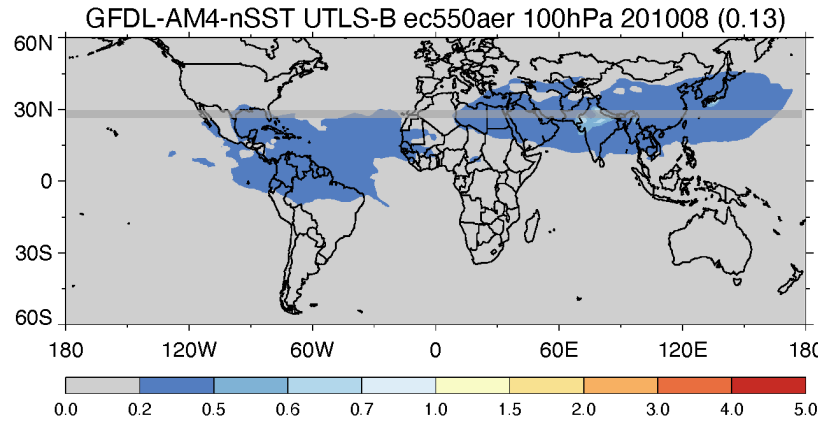
| Model | Experiment | Submission status |
|--------------------|--------------------------------------|-------------------|
| GEOS-i33p2 | BASE, ANTO, VOLO, FIRO, EASO, SASO | Submitted |
| MIROC-SPRINTARS | BASE, ANTO, VOLO | Submitted |
| GFDL-AM4-fSST | BASE (other experiments will follow) | BASE submitted |
| GFDL-AM4-nSST | BASE (other experiments will follow) | BASE submitted |
| GISS-ModelE-MATRIX | In preparation | |
| GISS-ModelE-OMA | In preparation | |
| PNNL | Interested | |
| ECHAM6-HAMOZ | Interested | |

1. Aerosol extinction at 100 hPa & 28-30N curtain - 201008

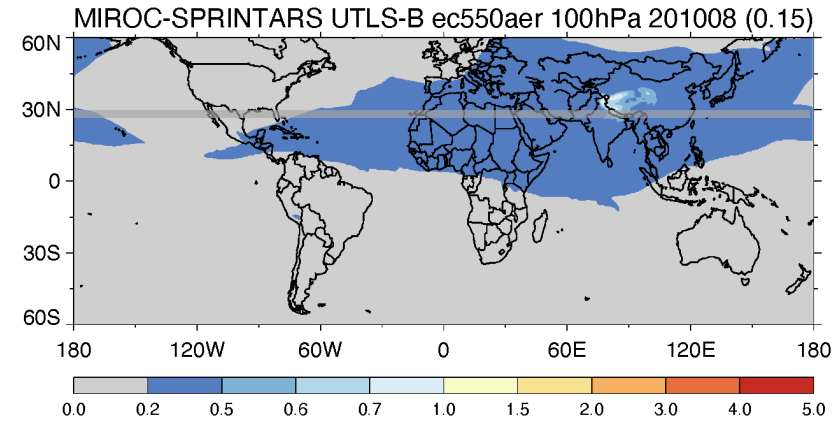
GEOS



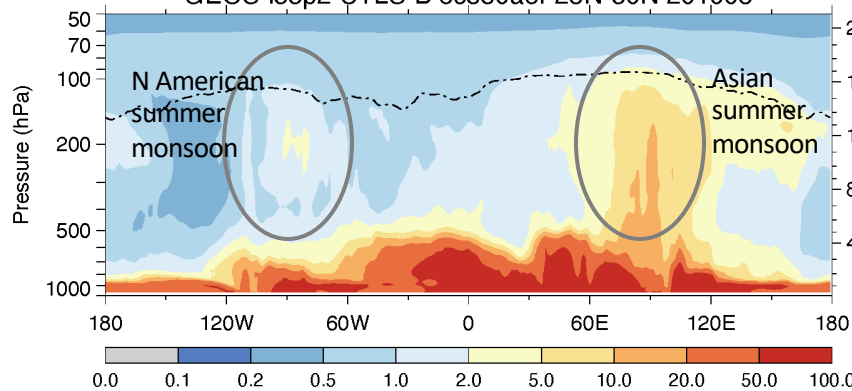
GFDL-AM4



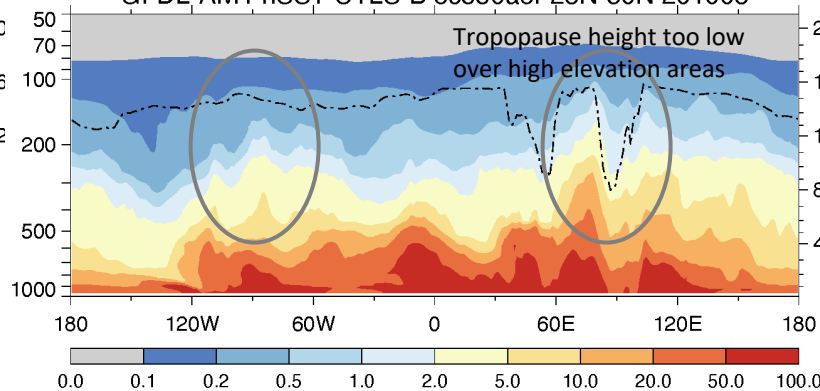
MIROC-SPRINTARS



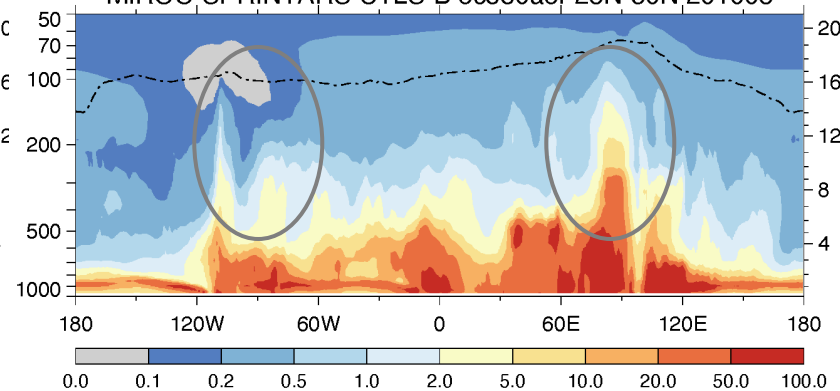
GEOS-i33p2 UTLS-B ec550aer 28N-30N 201008



GFDL-AM4-nSST UTLS-B ec550aer 28N-30N 201008



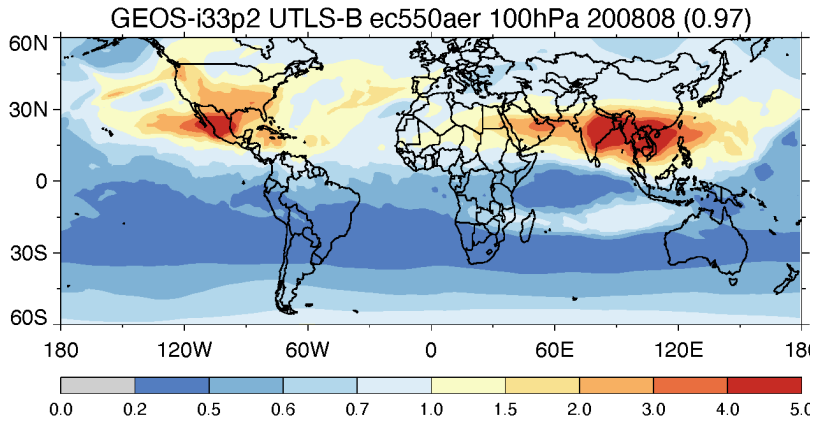
MIROC-SPRINTARS UTLS-B ec550aer 28N-30N 201008



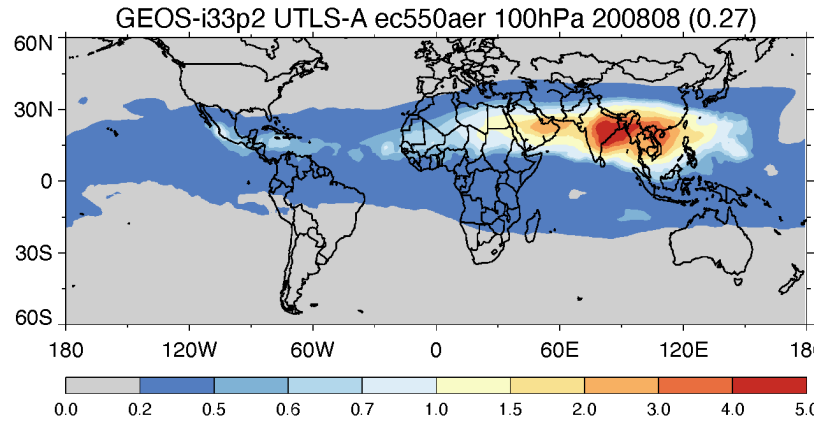
- Models show strong convective transport over Asian and N American summer monsoon regions
- However the amount reaching the tropopause and the Asian summer monsoon eastward/westward shedding are very different, resulting in large diversity in aerosol extinction in the UTLS

2a. Anthropogenic vs. volcanic contributions – GEOS

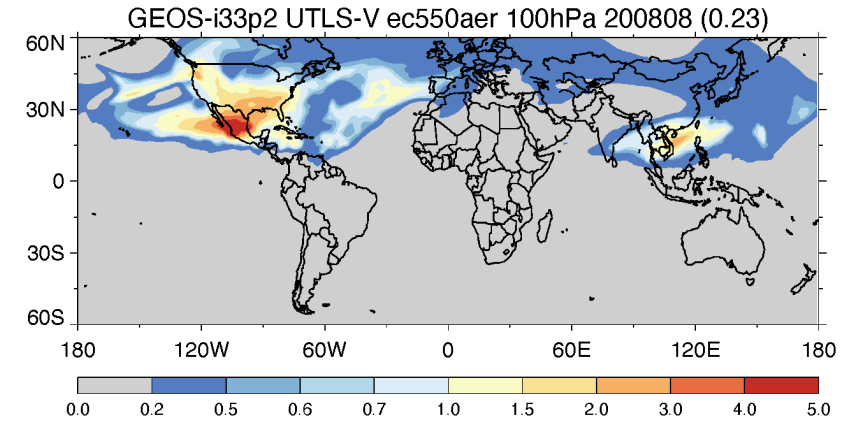
ec550aer – all sources



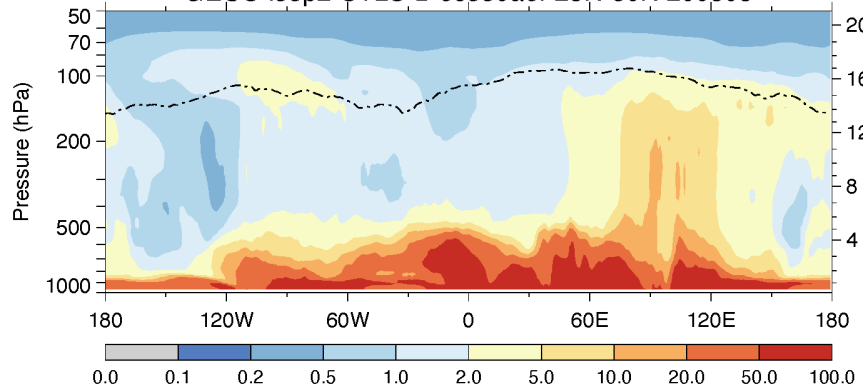
ec550aer - anthropogenic



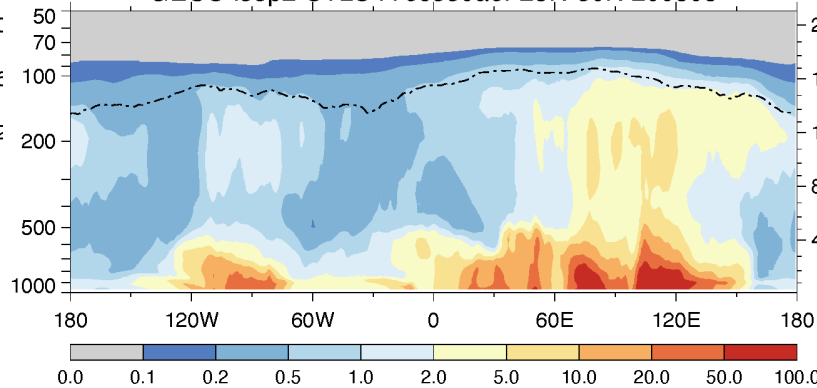
ec550aer - volcanic



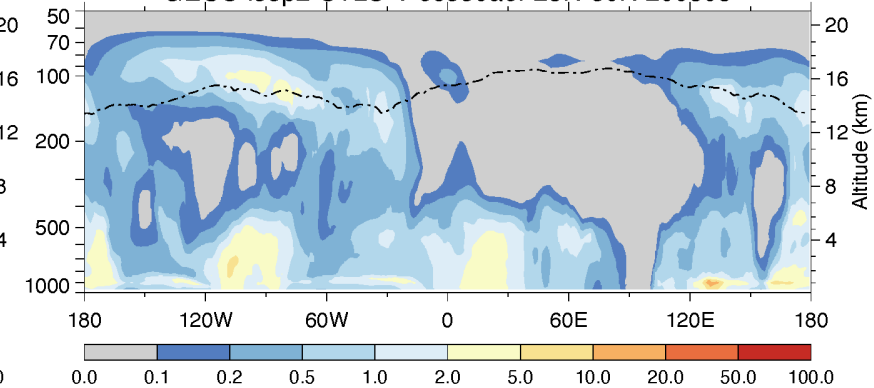
GEOS-i33p2 UTLS-B ec550aer 28N-30N 200808



GEOS-i33p2 UTLS-A ec550aer 28N-30N 200808



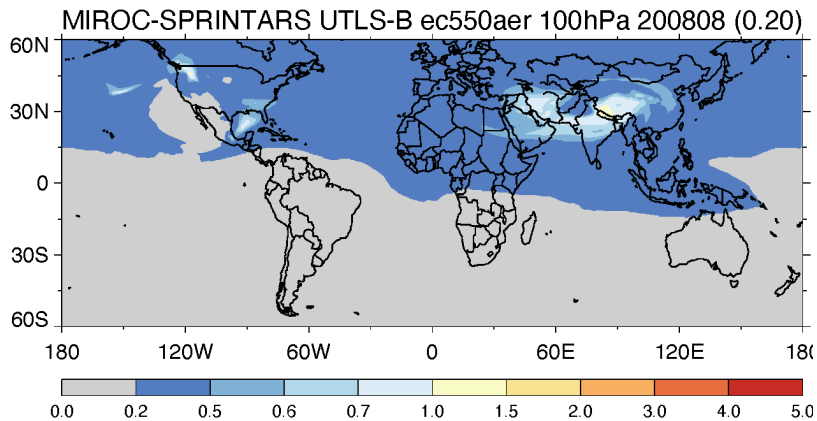
GEOS-i33p2 UTLS-V ec550aer 28N-30N 200808



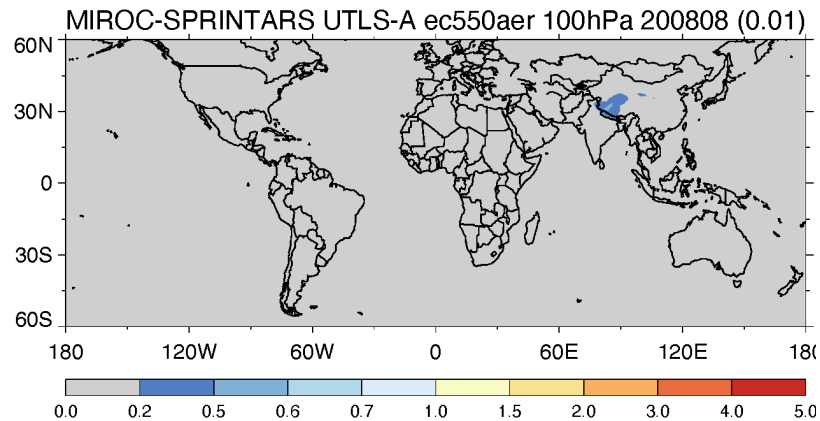
2008 is a volcanic active year (2010 is much quieter). GEOS shows significant volcanic aerosol sources in the tropopause region and in the lower stratosphere in the summer of 2008

2b. Anthropogenic vs. volcanic contributions – MIROC-SPRINTARS

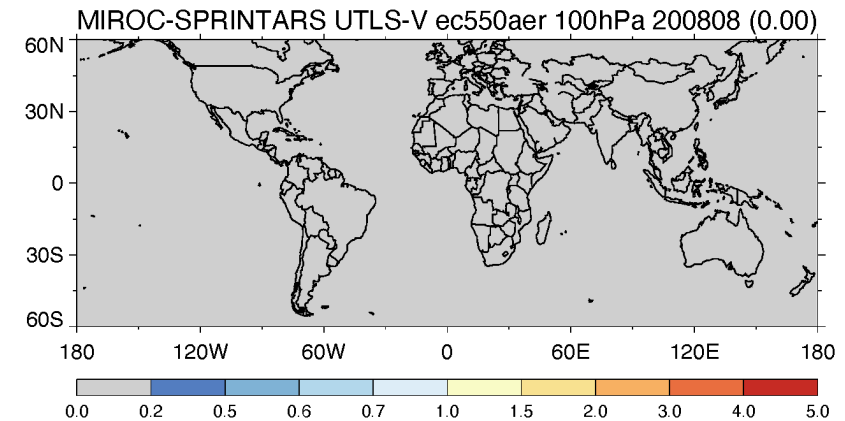
ec550aer – all sources



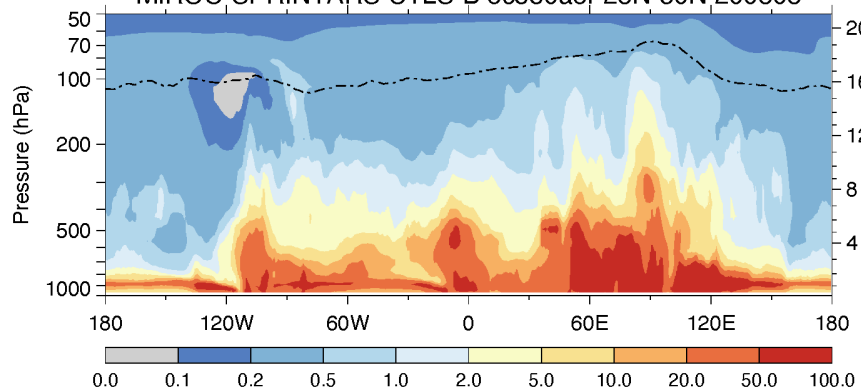
ec550aer - anthropogenic



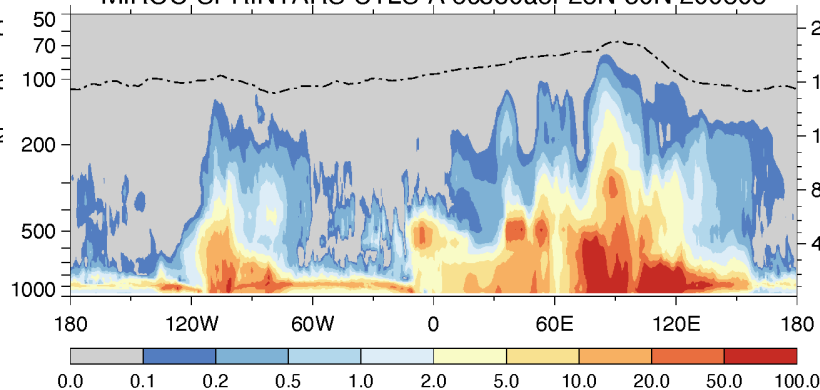
ec550aer - volcanic



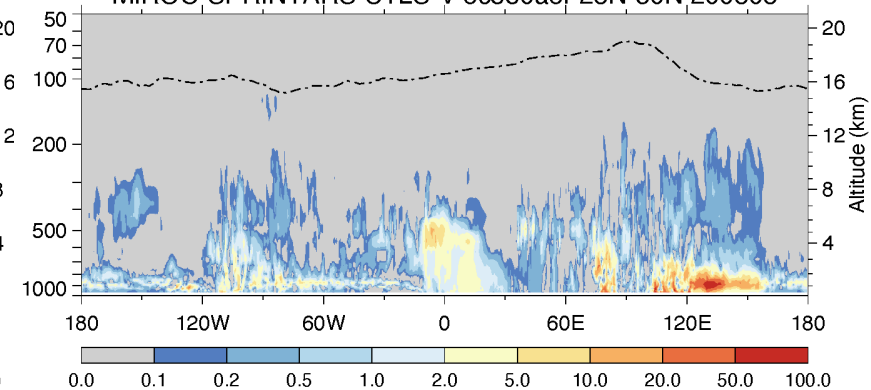
MIROC-SPRINTARS UTLS-B ec550aer 28N-30N 200808



MIROC-SPRINTARS UTLS-A ec550aer 28N-30N, 200808



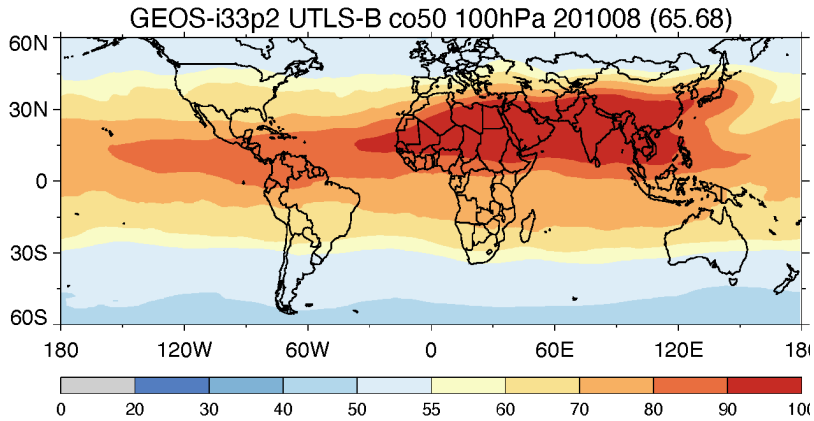
MIROC-SPRINTARS UTLS-V ec550aer 28N-30N, 200808



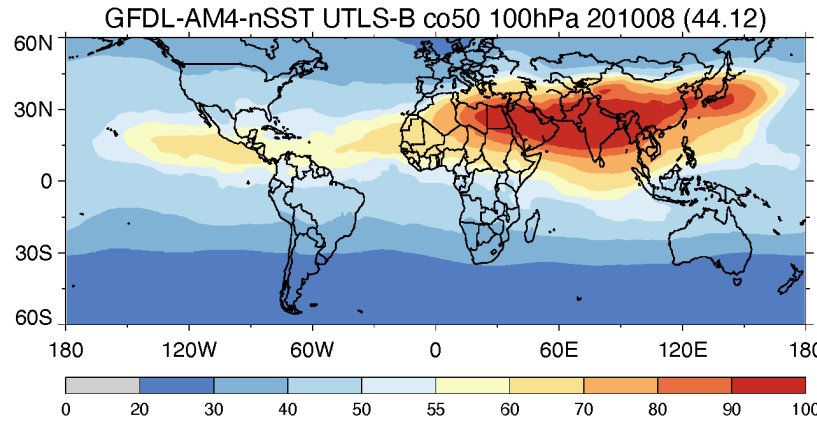
MIROC-SPRINTARS: Very different from GEOS. How is volcanic emission implemented (location, amount, height, timing)? The volcanic aerosol seems to have the same vertical pattern as total ec550aer and anthropogenic ec550aer.

3. CO50 as a transport tracer to diagnose inter-model differences

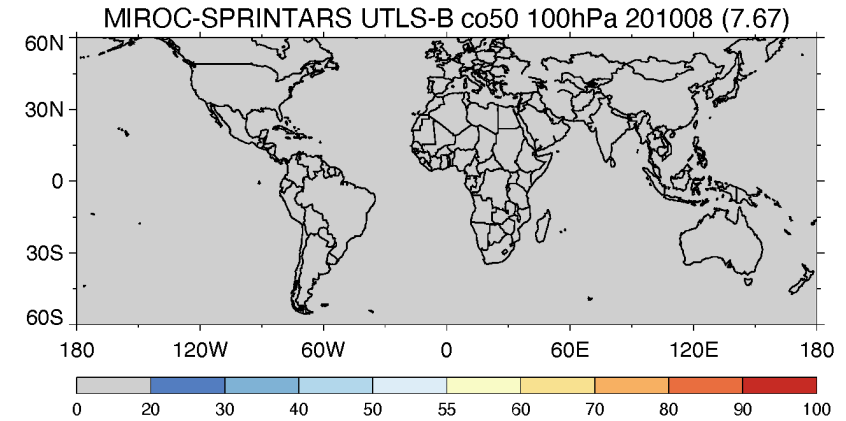
GEOS



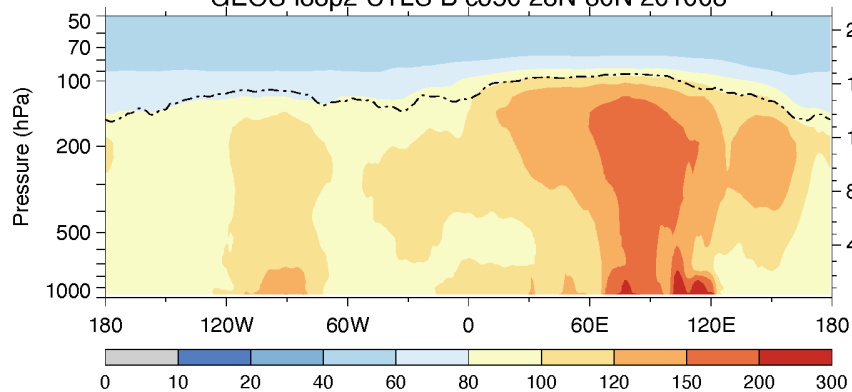
GFDL-AM4



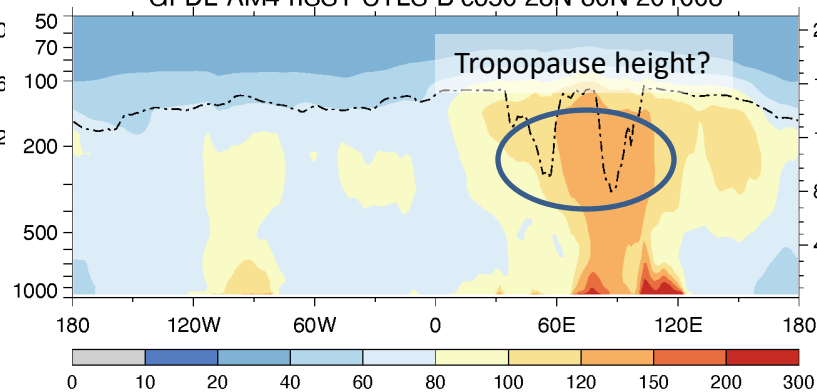
MIROC-SPRINTARS



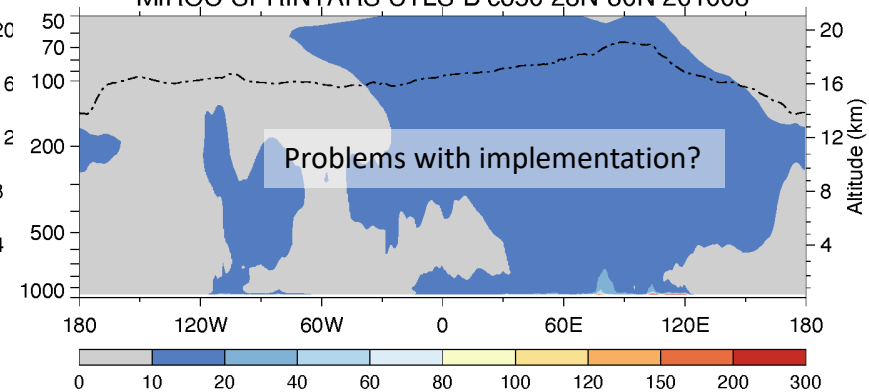
GEOS-i33p2 UTLS-B co50 28N-30N 201008



GFDL-AM4-nSST UTLS-B co50 28N-30N 201008



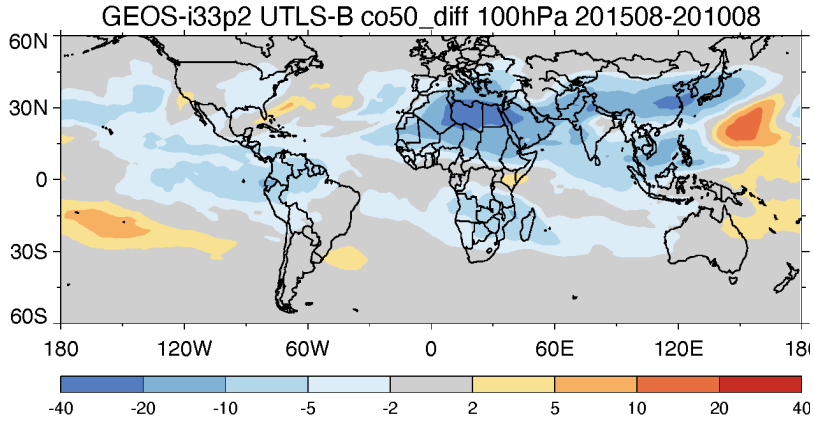
MIROC-SPRINTARS UTLS-B co50 28N-30N 201008



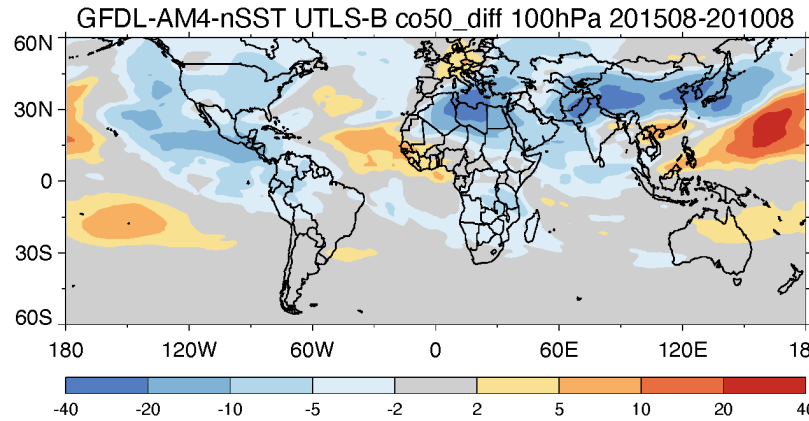
- CO with prescribed sources and 50-day lifetime serves as a tracer for diagnosing transport among models
- Need further investigations on the consistency between models on emission, CO production from CH₄
- MIROC-SPRINTARS seems not doing co50 correctly (no transport?)

4. CO50 as a transport tracer to diagnose inter-annual differences: difference between Aug 2010 and Aug 2015 (201508-201008)

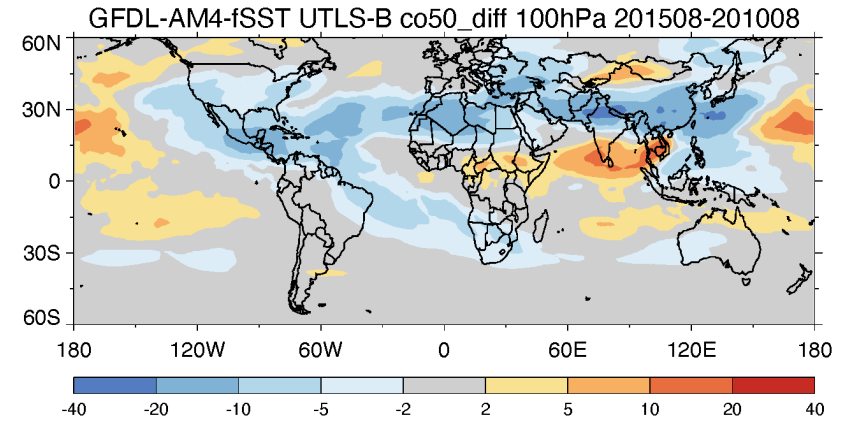
GEOS (reply)



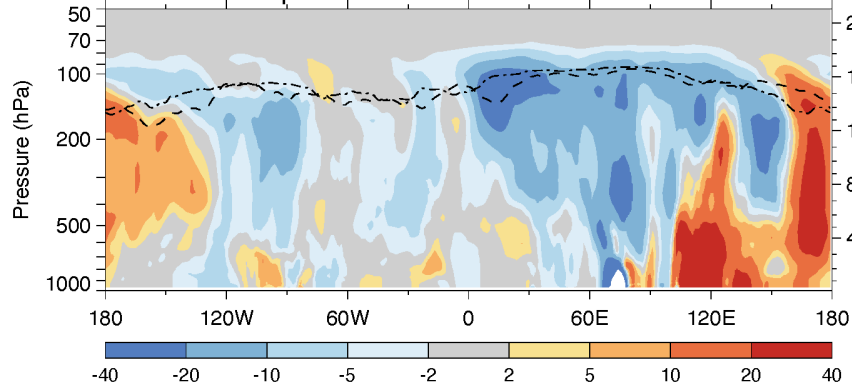
GFDL-AM4 (nudged met)



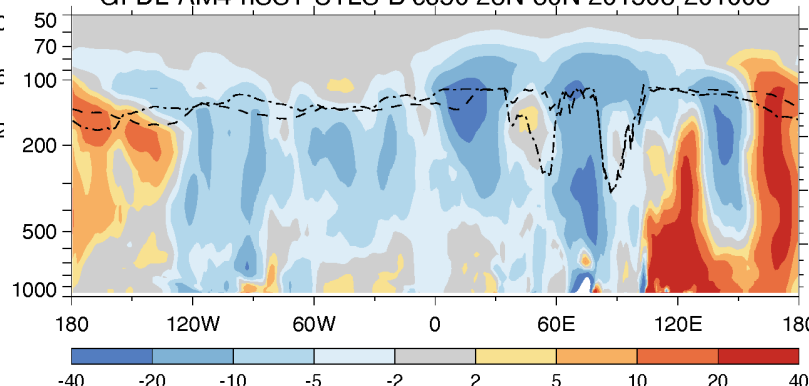
GFDL-AM4 (fixed SST)



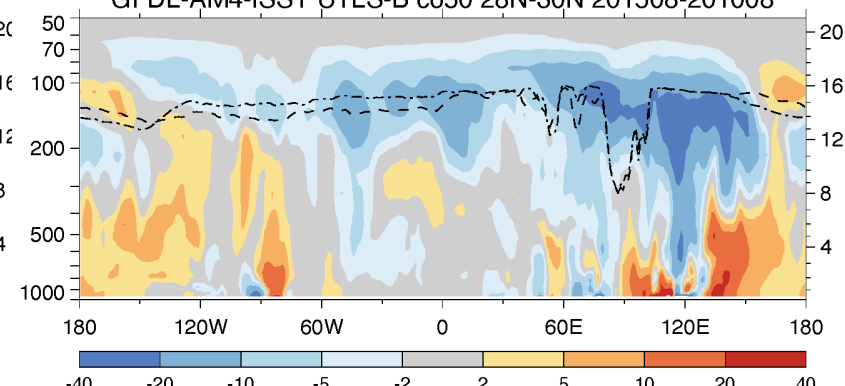
GEOS-i33p2 UTLS-B co50 28N-30N 201508-201008



GFDL-AM4-nSST UTLS-B co50 28N-30N 201508-201008



GFDL-AM4-fSST UTLS-B co50 28N-30N 201508-201008



- CO with subscribed sources and 50-day lifetime serves as a tracer for diagnosing interannual variability
- The convective transport in the summer of 2015 (El Niño year) to the UTLS over large area is weaker over land but stronger over the Pacific than that in the summer of 2010 (La Niña year)

5. UTLS aerosol from other AeroCom models – results from CTRL simulations

- CO, SO₂, ec550aer, and aerosol composition (BC, OA, SO₄⁻, NO₃⁻, dust, sea salt) – guess which specie has the smallest or largest diversity at upper troposphere?
 - Come to see the display in **Breakout session #1** (Tuesday, 13 October): 12 AeroCom models, summer 2010

